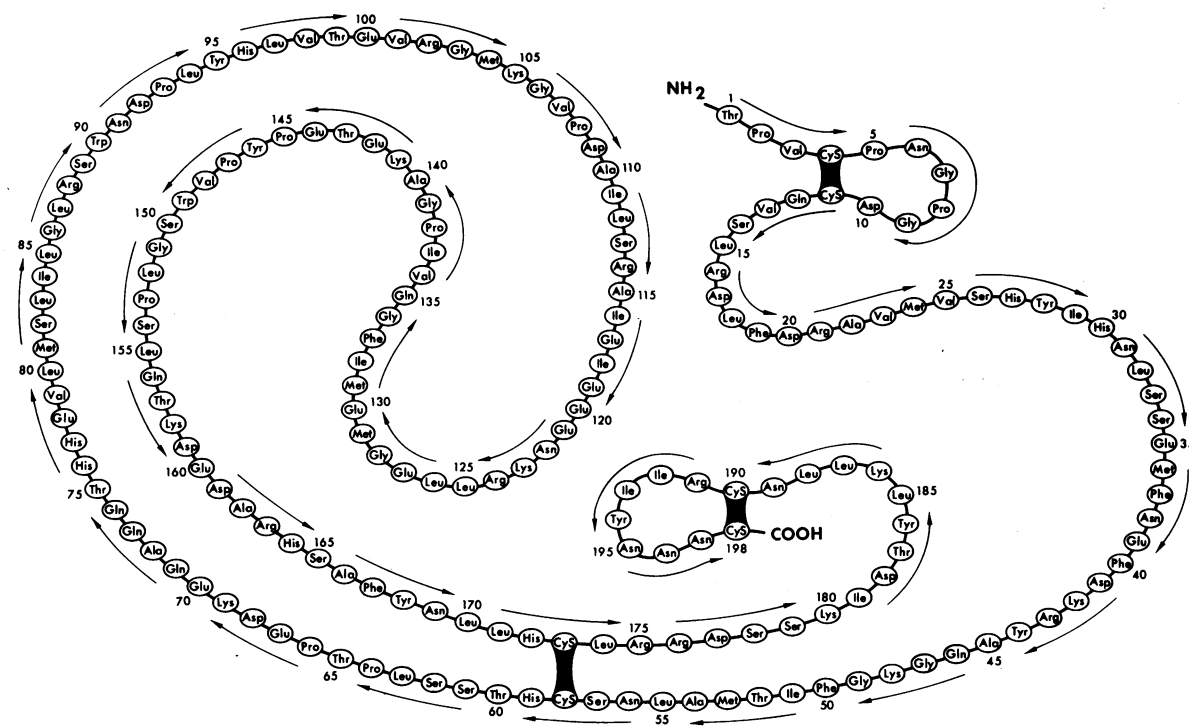


Prolactin

THE FIRST INDICATION that a hormone of the anterior pituitary might effect lactation in mammals came from the experiments of P. Stricker and F. Grueter in 1928. Later, O. Riddle reported growth of the crop glands of pigeons after the injection of pituitary extracts. Subsequent work indicated that this effect in birds is due to the same hormone that induces lactation in rats and rabbits. Lactogenic activity has been reported to be present in the pituitary extracts of various species, including humans, sheep, cattle, pigs, horses, whales, rabbits, cats, rats, guinea pigs, mice, fish, amphibians, reptiles and birds. Highly purified prolactin preparations were obtained from cattle and sheep pituitary glands by a number of investigators during the period of 1937-1955. The sheep prolactin molecule is a protein consisting of 198 amino acids with a molecule weight of 23,000; the exact ar-

rangement of these amino acids in definite sequence (see chart) was discovered in 1969 by scientists of the Hormone Research Laboratory on the San Francisco campus of the University of California.

Since the isolation of the growth hormone (HGH) from the human pituitary glands in 1956 and the demonstration of its intrinsic lactogenic activity in 1961, attempts to obtain from extracts of human pituitaries a distinct preparation which chemically differs from HGH and possesses only lactogenic activity have been unsuccessful. However, J. L. Pasteels, W. H. Daughaday, A. G. Frantz and others gave evidence for the existence of prolactin in the human gland from histological, clinical and biological studies. The final proof of its existence came from the isolation of human prolactin (HP) in highly purified form by U. J. Lewis, H. Friesin and their co-workers in 1971. HP and HGH exhibit overlapping biological activities: For each milligram, HP possesses 25 international units (IU) of lactogenic activity and 0.4 USP units of growth-promoting activity, whereas HGH has 2 IU of lactogenic activity and 2 USP U growth-promoting activity. They also have similar molecular weight. A single human pituitary gland contains approximately 0.02 mg HP and 10 mg HGH. In light of these data, it is not surprising there



Amino acid sequence of the ovine prolactin molecule

was delay in recognizing the definitive existence of the prolactin molecule in pituitary glands of humans.

Human prolactin has now been isolated and identified. It is important to elucidate its amino acid sequence. A previous comparison of the primary structures of HGH and sheep prolactin indicated a high degree of homology and suggested that these two molecules must have evolved from a common ancestor. It would be of great interest to compare the amino acid sequence of HP with that of HGH. This comparison may also provide an explanation of the intrinsic lactogenic activity in the HGH molecule.

Prolactin is remarkable in its broad spectrum of biological activities among the vertebrates. The role of prolactin in mammary-gland development and function has long been recognized. It acts as a synergist with steroid hormones in the sequential development of ductal and lobuloalveolar components of the mammary tree (mammogenic action). Secretory activity is also dependent upon the action of prolactin in synergism with adrenal hormones to initiate milk production (lactogenic action) and to maintain and augment it (galactopoietic action). In birds, two of the most striking actions of prolactin are stimulation of crop "milk" formation in pigeons and doves and induction of brood-patch developments in a variety of species. Prolactin caused increased body weight in tadpoles.

For fresh-water fish, prolactin is essential for the survival of osmotic stress. In efts, prolactin induced the land-living stage of this species to return prematurely to water. The water-drive activity of prolactin is also seen in salamanders. Thus, the versatility of prolactin raises an important question: What are other functions of prolactin in human subjects besides its role in the mammary-gland development and function?

In experiments with animals, prolactin is found to be one of the factors involved in the growth of mammary carcinoma. Does HP play a role in the initiation and maintenance of breast cancer patients? There is evidence that prolactin induces the growth of prostate glands in some laboratory animals. Does HP play a role in the initiation and maintenance of normal and/or abnormal growth of prostate glands in man? Investigations on human prolactin in the next few years will undoubtedly provide us interesting and exciting data of its physiological functions in health and disease.

CHOH HAO LI, PH D

*Professor and Director
Hormone Research Laboratory
University of California, San Francisco*

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